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10TH MATHEMATICS
TRIGONOMETRY

21 X 1 = 21

1. If the ratio of the height of a tower and the length of its shadow is $\sqrt{3}:1$ then the angle of elevation of the sun has measure

   (a) $45°$ (b) $30°$ (c) $90°$ (d) $60°$

2. The electric pole subtends an angle of $30°$ at a point on the same level as its foot. At a second point $'b'$ metres above the first, the depression of the foot of the tower is $60°$. The height of the tower (in metres) is equal to

   (a) $\sqrt{3}b$ (b) $\frac{b}{3}$ (c) $\frac{b}{2}$ (d) $\frac{b}{\sqrt{3}}$

3. A tower is $60m$ height. Its shadow is x metres shorter when the sun's altitude is $45°$ than when it has been $30°$ then x is equal to

   (a) $41.92m$ (b) $43.92m$ (c) $43m$ (d) $45.6m$

4. The angle of depression of the top and bottom of $20m$ tall building from the top of a multi storied building are $30°$ and $60°$ respectively. The height of the multi storied building and the distance between two buildings (in metres) is

   (a) $20,10\sqrt{3}$ (b) $30,5\sqrt{3}$ (c) $20,10$ (d) $30,10\sqrt{3}$

5. Two persons are standing $'x'$ metres apart from each other and the height of the first person is double that of the other. If from the middle point of the line joining their feet an observer finds the angular elevations of their tops to be complementary, then the height of the shorter person (in metres) is

   (a) $\sqrt{2}x$ (b) $\frac{x}{2\sqrt{2}}$ (c) $\frac{x}{\sqrt{2}}$ (d) $2x$

6. The angle of elevation of a cloud from a point h metres above a lake is β. The angle of depression of its reflection in the lake is $45°$. The height of location of the cloud from the lake is

   (a) $\frac{h(1+tan\beta)}{1-\tan\beta}$ (b) $\frac{h(1-\tan\beta)}{1+\tan\beta}$ (c) $htan(45°-\beta)$ (d) none of these

7. A pole $6m$ high a shadow $2\sqrt{3}m$ long on the ground, then the sun's elevation is

   (a) $60°$ (b) $45°$ (c) $30°$ (d) $90°$

8. The maximum value of $sin\theta$ is

   (a) $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) 1 (d) $\frac{1}{\sqrt{2}}$

9. The angle of elevation of the top of tree from a point at a distance of $250m$ from its base is $60°$. The height of tree is:

   (a) $250m$ (b) $250\sqrt{3}$ (c) $\frac{250}{3}m$ (d) $200\sqrt{3}$

10. The angle of depression of a boat from a $50\sqrt{3}m$ high bridge is °. The horizontal distance of the boat from the bridge is :

    (a) $150m$ (b) $150\sqrt{3}$ (c) $60m$ (d) $60\sqrt{3}$

11. A ladder of length $14m$ just reaches the top of a wall. If the ladder makes an angle of $60°$ with the horizontal, then the height of the wall is:

    (a) $14\sqrt{3}$ (b) $28\sqrt{3}$ (c) $7\sqrt{3}$ (d) $35\sqrt{3}$

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12. The top of two poles of height $18.5m$ and $7m$ are connected by a wire. If the wire makes an angle of measures $360°$ with horizontal, then the length of the wire is;

   (a) $23m$ (b) $18m$ (c) $28m$ (d) $25.5m$

13. The blanks of river are parallel. A swimmer starts from a point on one of the blanks and swims in a straight line to the bank at $45°$ and reaches the opposite bank at a point $20m$, from the point opposite to the straight point. The breadth of the river is equal to:

   (a) $12.12m$ (b) $14.14m$ (c) $1016.16m$ (d) $18.18m$

14. If the angle of elevation of a tower from a distance of $100m$ from its foot is $60°$, then the height of the tower is

   (a) $100\sqrt{3}m$ (b) $\frac{100}{\sqrt{3}}m$ (c) $50\sqrt{3}m$ (d) $\frac{200}{\sqrt{3}}m$

15. If the altitude of the sun is at $60°$, then height of the vertical tower that will cast a shadow of length $30m$ is

   (a) $30\sqrt{3}m$ (b) $15m$ (c) $\frac{30}{\sqrt{3}}m$ (d) $15\sqrt{2}m$

16. The angles of elevation of a tower from two points distant a and $b(a > b)$ from its foot and in the same straight line from if are $30°$ and $60°$, then the height of the tower is

   (a) $\sqrt{a+b}$ (b) $\sqrt{ab}$ (c) $\sqrt{a-b}$ (d) $\sqrt{\frac{a}{b}}$

17. The angle of elevation and depression are usually measured by a device called

   (a) Theodolite   (b) kaleidoscope   (c) periscope   (d) telescope

18. The angle of depression of a car, standing on the ground from the top of a $75m$ tower is $30°$. The distance of the car from the base of the tower in metres is

   (a) $25\sqrt{3}$ (b) $50\sqrt{3}$ (c) $75\sqrt{3}$ (d) 150

19. A tower subtends an angle $30°$ at a point on the same level as its foot. At a second point h metres above the first depression of the foot of the tower is $60°$. The height of the tower is

   (a) $\frac{h}{2}m$ (b) $\sqrt{3}hm$ (c) $\frac{h}{3}m$ (d) $\frac{h}{\sqrt{3}}m$

20. The angles of depression of two ships from the top of a light house are $45°$ and $30°$ towards east. If the ships are $100m$ apart, the height of the light house is

   (a) $\frac{50}{\sqrt{3}+1}m$ (b) $\frac{50}{\sqrt{3}-1}m$ (c) $50(\sqrt{3}-1)m$ (d) $50(\sqrt{3}+1)m$

21. If the altitude of the light house is metres and from it's the anger of depression of two ships on opposite sides of the light house are observed to be $30°$ and $45°$, then the distance between the ships are

   (a) $(\sqrt{3}+1)h$ metres   (b) $(\sqrt{3}-1)h$ metres   (c) $\sqrt{3}h$ metres

   (d) $1 + \left(1 + \frac{1}{\sqrt{3}}\right)h$ metres

15 X 2 = 30

22. A tower stands vertically on the ground from a point on the ground, which is $48m$ away from the foot of the tower, the angle of elevation of the top of the tower is $30°$. Find the height of the tower.

23. Find the angle of elevation of the top of a tower from a point on the ground, which is $30m$ away from the foot of a tower of height $10\sqrt{3}m$.

24. A road is flanked on either side by continuous rows of houses of height $4\sqrt{3}m$ with no space is between them. A pedestrian is standing on the median of the road facing a row house. The angle of elevation from the pedestrian to the top of the house is $30°$. Find the width of the road.

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25. From the top of a rock $50\sqrt{3}m$ high, the angle of depression of a car on the ground is observed to be $30°$. Find the distance of the car from the rock.

26. The horizontal distance between two buildings is $70m$. The angle of depression of the top of the first building when seen from the top of the second building is $45°$. If the height of the second building is $120m$, find the height of the first building.

27. A player sitting on the top of a tower height $20m$ observes the angle of depression of a ball lying on the ground as $60°$. Find the distance between the foot of the tower and the ball. ($\sqrt{3} = 1.732$)

28. The horizontal distance between two buildings is $140m$. The angle of depression of the top of the first building when seen from the top of the second building is $30°$. If the height of the first building is $60m$, find the height of the second building. ($\sqrt{3} = 1.732$)

29. Find the angle of elevation of the sun when the shadow of a pole h metres high is $\sqrt{3}h$ metres long.

30. A ladder 15metres long just reaches the top of a vertical wall. If the ladder makes an angle of $60°$ with the wall, find the height of the wall.

31. An observer 1.5metres tall is 20.5metres away from a tower 22 metres high. Determine the angle of elevation of the top of the tower from eye of the observer.

32. A tower is $100\sqrt{3}$ metres high. Find the angle of elevation of its top from a point 100metres away from its foot.

33. The angle of elevation of the top of a tower from a point on the ground, which is $30m$ away from the foot of the tower is $30°$. Find the height of the tower.

34. A kite is flying at a height of $60m$ above the ground. The inclination of the string with the ground where its string is tied is $60°$. Find the length of the string.

35. A tower stands vertically on the ground from a point on the ground which is $20m$ away from the foot of the tower, the angle of elevation of the top of the tower is found to be $60°$. Find the height of the tower.

36. The angle between the top of a building and a point $80m$ away from the base on level ground is $60°$. How tall is the building?

30 X 5 = 150

37. Two ships are sailing in the sea on either sides of a lighthouse as observed from the ships are $30°$ and $45°$ respectively. If the lighthouse is $200m$ high, find the distance between the two ships. ($\sqrt{3} = 1.732$).

38. A bike is flying at a height of $75m$ above the ground, the string attached to the kite is temporarily tried to a point on the ground. The inclination of the string with the ground is $60°$. Find the length of the string, assuming that there is no slack in the string.

39. From a point on the ground, the angles of elevation of the bottom and top of a tower fixed at the top of a $30m$ high building are $45°$ and $60°$ respectively. Find the height of the tower. ($\sqrt{3} = 1.732$)

40. A tv tower stands vertically on a bank of a canal. The tower is watched from a point or the other bank directly opposite to it. The angels of elevation of the top of the tower is $58°$, from another point $20m$ away from this points on the line joining this point of the tower, the angle of elevation of the top of the tower is $30°$. find the height of the tower and the width of the canal. ($tan58° = 1.6003$)

41. An aeroplane sets of from G on bearing of $24°$ towards H, a point $250km$ away, at H it changes course and heads towards J on a bearing of $55°$ and a distance of $180km$ away.
How far is H to the north of G?

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$$\begin{pmatrix} \sin 24° = 0.4067 & \sin 11° = 0.1908 \\ \cos 24° = 0.9135 & \cos 11° = 0.9816 \end{pmatrix}$$
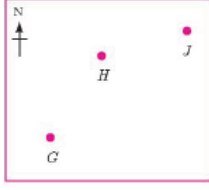
42. Two trees are standing on the flat ground. The angle of elevation of the top of both the trees from a point x on the ground is $40°$. If the horizontal distance between x and the smaller tree is $8m$ and the distance of the top of the trees is $20m$, calculate the distance between the point x and the top of the smaller tree.

43. To a man standing outside his house, the angles of elevation of the top and bottom of a window are $60°$ and $45°$ respectively. If the height of the man is $180cm$ and if he is 5m away from the wall, what is the height of the window? ($\sqrt{3} = 1.732$).

44. A statue $1.6m$ tall stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is $60°$ and from the same point the angle of elevation of the top of the pedestal is $40°$. Find the height of the pedestal. ($\tan 40° = 0.8391, \sqrt{3} = 1.732$)

45. A flag pole $'h'$ metres is on the top of the hemispherical dome of radius $'r'$ metres. A man is standing $7m$ away from the dome. Seeing the top of the pole at the angle $45°$ and moving $5m$ away from the dome and seeing the bottom of the pole at an angle $30°$. Find (i) the height of the pole (ii) radius of the dome ($\sqrt{3} = 1.732$).
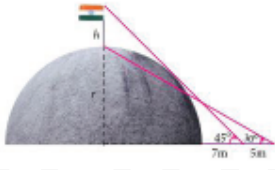
46. The top of a $15m$ high tower makes an angle of elevation of $60°$ with the bottom of an electronic pole and angle of elevation of $30°$ with the top of the pole. What is the height of the electric pole?

47. A vertical pole fixed to the ground is divided in the ratio $1:9$ by a mark on it with lower part shorter than the upper part. If the two parts subtend equal angles at a place on the ground, $25m$ away from the base of the pole, what is the height of the pole?

48. A traveller approaches a mountain on highway. He measures the angle of elevation to the peak at each milestone. At two consecutive milestones the angles measured are $4°$ and $8°$. What is the height of the peak if the distance between consecutive milestones is 1 mile. ($\tan 4° = 0.0699, \tan 8° = 0.1405$)

49. From the top of the tower 60m high the angles of depression of the top and bottom of a vertical lamp post are observed to be $38°$ and $60°$ respectively. Find the height of the lamp post $\tan 38° = 0.7812, \sqrt{3} = 1.732$)

50. An aeroplane at an altitude of 1800 m finds that boats are sailing towards it in the same direction. The angles of depression of the boats as observed from the aeroplane are $60°$ and $30°$ respectively. Find the distance between the two boats. ($\sqrt{3} = 1.732$)

51. From the top of a lighthouse, the angle of depression of two ships on the opposite sides of it are observed to be $30°$ and $60°$. If the height of the lighthouse is h meters and the line joining the ships passes through the foot of the lighthouse, show that the distance between ships is $\frac{4^{1/2}}{\sqrt{3}} m$

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52. A lift in a building of height 90 feet with transparent glass walls is descending from the top of the building. At the top of the building, the angle of depression to a fountain in the garden is $60°$. Two minutes later, the angle of depression reduces to $30°$. If the fountain is $30\sqrt{3}$ feet from the entrance of the lift, find the speed of the lift which is descending.

53. From the top of a tree of height $13m$ the angle of elevation and depression of the top and bottom of another tree are $45°$ and $30°$ respectively. Find the height of the second tree. $(\sqrt{3} = 1.732)$

54. A man is standing on the deck of a ship, which is $40m$ above water level. He observes the angle of elevation of the top of a hill as $30°$. Calculate the distance of the hill from the ship and the height of the hill. $\left(\sqrt{3} = 1.732\right)$

55. If the angle of elevation of a cloud from a point $'h'$ metres above a lake is θ_1 and the angle of depression of its reflection in the lake is θ_2. Prove that the height that the cloud is located from the ground is $\frac{h(tan\theta_1 + \tan\theta_2)}{\tan\theta_2 - \tan\theta_1}$

56. The angle of elevation of the top of a cell phone tower from the foot of a high apartment is $60°$ and the angle of depression of the foot of the tower from the top of the apartment is $30°$. If the height of the apartment in $50m$ find the height of the cell phone tower. According to radiations control norms, the minimum height of a cell phone tower should be $120m$. State if the height of the above mentioned cell phone tower meets the radiation norms.

57. The angles of elevation and depression of the top and bottom of a lamp post from the top of a $66m$ high apartment are $60°$ and $30°$ respectively. Find the height of the lamp post.

58. A bird is sitting on the top of a $80m$ high tree. From a point on the ground, the angle of elevation of the bird is $45°$. The bird flies away horizontally in such away that it remained at a constant height from the ground. After 2 seconds, the angle of elevation of the bird from the same point is $30°$. Determine the speed at which the bird flies. $(\sqrt{3} = 1.732)$

59. An aeroplane is flying parallel to the Earth's surface at a speed of $175 m/sec$ and at a height of $600m$. The angle of elevation of the aeroplane from a point on the Earth's surface is $37°$ at a given point. After what period of time does the angle of elevation increase to $53°$? $(\tan 53° = 1.3270, \tan 37° = 0.7536)$

60. A bird is flying from A towards B at an angle of $35°$ a point $30km$ away from A. At B it changes its course of flight and heads towards C on a bearing of $48°$ and distance $32km$ away.
How far is B to the north of A?
$(\sin 55° = 0.8192, \cos 55° = 0.5736, \sin 42° = 0.7431)$

61. Two ships are sailing in the sea on either side of the lighthouse. The angles of depression of two ships as observed from the top of the lighthouse are $60°$ and $45°$ respectively. If the distance between the ships is $200\left(\frac{\sqrt{3}+1}{\sqrt{3}}\right)$ metres, find the height of the lighthouse.

62. A building and a statue are in opposite side of a street from each other $35m$ apart. From a point on the roof of building the angle of elevation of the top of statue is $24°$ and the angle of depression of base of the statue is $34°$. Find the height of the statue. $(tan24° = 0.4452, \tan 34° = 0.6745)$

63. From the top of a tower $50m$ high, the angles of depression of the top and bottom of a tree are observed to be $30°$ and $45°$ respectively. Find the height of the tree. $(\sqrt{3} = 1.732)$

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64. As observed from the top of a $60m$ high lighthouse from the sea level, the angles of depression of two ships are $28°$ and $45°$. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships. $(\tan 28° = 0.5317)$

65. A man is watching a boat speeding away from the top of a tower. The boat makes an angle of depression of $60°$ with the man's eye when at a distance of $200m$ from the tower. After 10 seconds, the angle of depression becomes $45°$. what is the approximate speed to the boat (in km/hr) assuming that is sailing in still water? $(\sqrt{3} = 1.732)$

66. From the top of a $12m$ high building, the angle of elevation of the top of a cable tower is $60°$ and the angle of depression of its foot is $30°$. Determine the height of the tower.

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